

REMARKS:

Minor changes are made to this specification as shown above. Additionally, appropriate Headings were added to the specification. Also, applicant replaced commas (,) with decimal points (.) in decimal fractions throughout the specification. No new matter has been introduced. Applicant respectfully requests the Examiner to substitute the originally filed specification with the amended specification provided herewith. In the following arguments, page and line numbers refer to the substitute specification. Claims 1-12 are amended. New claims 13-18 are added. The support for all new claims can be found in the original claims 1-12. Claims 1-18 are pending in the application. Reexamination and reconsideration of the application, as amended, are respectfully requested.

Objection to the Specification:

The Examiner objected to the specification because there are no Headings in the disclosure and because commas (,) are used in decimal fractions. Also, the Examiner objected to the specification, because of a typographical error in the term "hydrophobicity" on page 2, line 17. Finally, the Examiner objected to the specification because it does not contain an abstract.

In response, applicant added appropriate Headings to the specification and replaced commas (,) with decimal points (.) in decimal fractions throughout the specification. Also, applicant corrected the typographical error noted by the Examiner. Additionally, applicant carefully reviewed the specification and corrected a number of misspellings as shown above. A substitute specification that incorporates all these changes is included herewith. Also, the substitute specification contains an abstract, as requested by the Examiner. Applicant believes that these amendments overcome the Examiner objections to the specification. Accordingly, applicant requests a withdrawal of the objection.

Claim Rejection Under 35 U.S.C. § 112, First Paragraph:

Claims 1-12 are rejected under 35 U.S.C. § 112, first paragraph, as based on a disclosure which is not enabling. In particular, the Examiner rejects claims 1-12 because “[m]odification and isolation step(s) is/are critical or essential to the practice of the invention, but not included in the claim(s).” This rejection has been overcome.

As explained on page 6, lines 29-32, of the instant specification, it is an unexpected discovery of the present invention that whey and soy proteins can be modified by sulfitolysis without oxidation to permit their precipitation in acidic conditions. Accordingly, applicant amended claim 1 to clarify that the critical steps of the method of the present invention are: a) providing a protein selected from the group consisting of whey and soy proteins; b) providing a reagent that forms sulfite ions; c) mixing the protein with the reagent under a condition to sulfonate the protein without using an oxidizing agent and to obtain a mixture containing a sulfonated protein; d) precipitating the sulfonated protein out of the mixture at an acid pH to form a precipitated sulfonated protein and a soluble sulfonated protein; and e) recovering the precipitated sulfonated protein or soluble sulfonated protein.

Claim Rejection Under 35 U.S.C. § 112, Second Paragraph:

Claims 1-12 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, claims 1-12 are rejected for failing to recite active method steps and using the term “characterized” instead of the terms “wherein” or “comprising.” In response, applicant amended claims 1-12 to address the Examiner’s rejections.

Claim 1 is also rejected for reciting the term “especially.” In response, applicant deleted the term from claim 1.

Claims 1 and 10 are rejected as indefinite for the use of an alternative expression “and/or” in claims 1 and 10. In response, applicant amended claims 1 and 10 by deleting the objected alternative expression.

Also, claims 1 and 10 are rejected for inconsistent use of the terms “sulfonated protein” and “sulfonated proteins.” In response, applicant corrected this inconsistency.

Also, claim 1 is rejected for the use of the terms “optionally” and “such as.” In response, applicant deleted the objected terms.

Claims 2 and 4 are rejected for the recitation of two different ranges. In response, applicant amended claims 2 and 4 by deleting one of the recited ranges. The ranges deleted from claims 2 and 4 are presented in new dependent claims 14 and 15, respectively.

Claim 3 is rejected for using insufficient antecedent basis in the limitation “the protein content.” This rejection is moot due to the deletion of the term.

Claim 5 is rejected for improper antecedent basis for the recitation “at (a) the pH is adjusted.” In response, applicant replaced article “the” with article “a” in amended claim 5.

Also, claim 5 is rejected for the recitation of two different ranges. In response, applicant amended claim 5 by deleting one of the recited ranges. The range deleted from claim 5 is presented in new dependent claim 16.

Claim 6 is rejected as indefinite for using the phrase “to one.” In response, applicant deleted the objected term.

Claim 6 is also rejected for using insufficient antecedent basis for reciting the limitation “in stage (a)” in line 2 and confusing for using two different broad ranges in one claim. In response, applicant deleted the recitation “in stage (a).” Also, applicant amended claim 6 by deleting one of the recited ranges. The range deleted from claim 6 is presented in new dependent claim 17.

Claims 5-6, 9-10 and 12 are indefinite in using commas (,) to identify decimal numbers. In response, applicant amended the claims by replacing commas (,) with decimal points (.) in all decimal fractions recited in claims 5-6, 9-10 and 12.

Claim 7 is rejected for using insufficient antecedent basis for limitation "the sulfonation degree." In response, applicant replaced article "the" with article "a" in amended claim 7. Claim 7 is also rejected for reciting the term "varying." In response, applicant deleted the objected term.

Claim 9 is rejected for the recitation of two different ranges. In response, applicant amended claim 9 by deleting one of the recited ranges. The range deleted from claim 5 is presented in new dependent claim 18.

Claim 10 is rejected for using insufficient antecedent basis for the limitation "the sulfone groups." In response, applicant deleted article "the" from the term "sulfone groups."

Claim 11 is rejected for using insufficient antecedent basis of the limitation "the remaining sulfite." This rejection is moot due to deletion of the term.

Applicant believes that the above amendments overcome all rejections under 35 U.S.C. § 112, second paragraph. Accordingly, applicant respectfully requests a withdrawal of the rejections.

Claim Rejection Under 35 U.S.C. § 103(a):

Claims 1-12 are rejected under 35 U.S.C. § 103(a) as being unpatentable over WO 95/22907 (the '907 patent) taken with Petruccelli et al., (J. Agric. Food Chem. Vol. 43, pp. 2001-2006 (1995)) (Petruccelli). This rejection is respectfully traversed.

Independent claim 1 requires a) providing a protein selected from the group consisting of whey and soy proteins; b) providing a reagent that forms sulfite ions; c) mixing the protein with the reagent under a condition to sulfonate the protein without using an oxidizing agent and to obtain a mixture containing a sulfonated protein; d) precipitating the sulfonated protein at an acid pH to form a precipitated sulfonated protein and a soluble sulfonated protein; and e) recovering the

precipitated sulfonated protein or soluble sulfonated protein. Thus, claim is directed to a method of isolation of whey and soy proteins by utilizing non-oxidative sulfitolysis to precipitate the proteins.

The '907 patent and Petruccelli do not make independent claim 1 of the present invention obvious because the present invention provides unexpected results. It is an unexpected discovery of the present invention that complete sulfitolysis, such as oxidative sulfitolysis, is not necessary for precipitation of whey and soy proteins out of a solution. As explained on page 6, lines 29-33, of the instant specification, non-oxidative sulfitolysis produces sufficient cleavage of disulfide bonds in whey and soy proteins to modify protein molecules and to precipitate them out of the solution. Advantageously, omitting oxidation simplifies and speeds up the process rendering it economically more profitable. As shown in Examples 1-8, the method of the present invention unexpectedly allows precipitation of as much as 66% of the protein by using non-oxidative sulfitolysis. Thus, the present invention provides unexpected result of precipitating whey and soy proteins by using a non-oxidative sulfitolysis.

The '907 patent teaches a method for modification and isolation of whey proteins by oxidative sulfitolysis. The '907 patent teaches that complete oxidation of free sulphydryl groups formed in the sulfitolysis is required to precipitate whey protein out of solution (page 3, line 21 – page 4, line 15). Petruccelli has no teaching of precipitating whey or soy proteins, much less of precipitating whey or soy proteins without complete sulfitolysis. Instead, Petruccelli teaches sulfonation conditions to achieve a partial reduction of soy protein disulfide bonds. Although, Petruccelli indicates that catalyst (Cu) and oxygen show a similar effect in the sulfitolysis of soy proteins with Na_2SO_3 and simultaneous presence of both agents is not required, Petruccelli concludes that the presence of oxidizing agent is needed to achieve complete sulfitolysis (abstract and page 2006, second paragraph under Conclusions). Since unexpected results have been achieved in the present invention by using a method, which doesn't require a complete sulfitolysis to precepitate whey

and soy proteins, a description of a method for protein precipitation that relies on oxidative sulfitolysis and a description of a method of complete sulfitolysis in a presence of oxygen and incomplete sulfitolysis in a presence of Cu catalyst do not make the present invention obvious.

Moreover, even if the teaching of Petruccelli were to be applied to the method of the '907 patent, one would not have obtained the method of claim 1 of the present invention. The Examiner acknowledges that the '907 patent does not teach using non-oxidative sulfitolysis to isolate proteins, but relies on the Petruccelli for teaching of complete sulfitolysis without using an oxidizing agent. Applicant disagrees with the Examiner's reading of the Petruccelli. As discussed above, Petruccelli teaches that the presence of oxidizing agent is needed to achieve complete sulfitolysis and that Cu catalyst doesn't produce complete sulfitolysis. Based on this teaching, those skilled in the art would have been discouraged to use Cu catalyst instead of oxygen in the method of the '907 patent, because the use of Cu catalyst does not produce the complete sulfitolysis required by the '907 patent.

Finally, the cited references teach away from a combination proposed by the Examiner. The '907 patent states that "[w]hen a food-grade oxidative compound is used ... disadvantages associated with the use of a catalyst are eliminated." (last sentence of the abstract). Furthermore, Petruccelli also notes that "[t]he use of oxygen has some advantages over that of Cu, since ... Cu is kept within the protein structure; this situation is dangerous both from the functional and from the nutritional point of view." Based on these teachings, those skilled in the art would have been discouraged to substitute oxygen in the method of the '907 patent with a copper catalyst of Petruccelli. Therefore, claim 1 and its dependent claims 2-12 are not obvious in view of a combination of the '907 patent and Petruccelli.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (213) 337-6700 to discuss the steps necessary for placing the application in condition for allowance.

If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,
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